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Major Patrick W. Christopherson

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Forces Commander

Approved by:

\_\_\_\_\_  
LTC Kim S. Summers, MA Monograph Director

\_\_\_\_\_  
Col Robin P. Swan, MMAS Director, School of Advanced  
Military Studies

\_\_\_\_\_  
Philip J. Brookes, Ph.D. Director, Graduate Degree  
Program

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## ABSTRACT

J-SEAD: CHALLENGES FACING THE JOINT FORCES COMMANDER by  
MAJ Patrick W. Christopherson, USAF, 41 pages.

The Joint Forces Commander's (JFC) ability to execute an effective Joint Suppression of Enemy Air Defense (J-SEAD) campaign is critical. To best employ with limited assets, the JFC has to make intelligent use of available means to create favorable conditions for success. This realization is particularly true within the J-SEAD arena where the unique capabilities of the individual service components systems are at a premium.

This monograph analyzes the challenges facing the JFC pertaining to executing a J-SEAD campaign. After a brief discussion on the importance of the subject and research methodology, the main research surrounding the key portions of the J-SEAD problem are presented. Joint and service component doctrine, assets, and current capabilities are discussed as they currently exist. Some of the obvious integration issues influencing J-SEAD are also mentioned.

Having reviewed the major ingredients that make up the JFC's J-SEAD capabilities, disparities in doctrine, gaps in capabilities, and integration problems are then highlighted. This analysis provides an increased awareness and potential footing for improving the ability of the JFC to prosecute future J-SEAD operations. Ultimately, the ability to recognize weak areas in J-SEAD doctrine, resourcing, and integration is where this monograph gains value.

The study concludes that JFC's challenges for J-SEAD are substantial. Joint doctrine provides only generic assistance to the JFC to structure his organization however it does provide the JFC sufficient leniency to "build" an organization as seen fit. In general, service component doctrine is incomplete and only adds to the confusion. Furthermore, the inability for any one service to conduct autonomous full-spectrum SEAD operations does not exist. Thus, the JFC must circumnavigate the service component barriers by setting up a coordinated J-SEAD effort to make best use of limited SEAD assets available. To succeed, the JFC will have to transcend resistance, well within authority, to conduct the type J-SEAD operations that will ensure future air domination.

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## I. INTRODUCTION

"The whole idea of electronic warfare (EW) needs to be rethought...it can't just be pumping electrons...it has to be a balance between stealth,...jamming,...info warfare. They all play a part in this force protection business."

-CSAF General Michael Ryan<sup>1</sup>

### *Background and Significance*

The Armed Services of the United States are increasingly reliant on employing as a joint team. The individual service's competition for a limited defense budget and resources combined with political realities make the ability to employ autonomously nearly obsolete. The nature of modern warfare demands we fight as a joint team<sup>2</sup>. Recognized at all levels within the armed forces, the effects are most prevalent within the boundaries of a Joint Operations Area (JOA) under the command of a Joint Forces Commander (JFC). To best employ with limited assets, the JFC has to make intelligent use of available means to create favorable conditions for success. This realization is particularly true within the Joint Suppression of Enemy Air Defense (J-SEAD) arena where the unique capabilities of the individual systems are at a premium. Before advancing, clarification of the topic area is necessary.

Suppression of enemy air defenses (SEAD) is any activity that neutralizes, destroys, or temporarily degrades enemy surface based air defenses<sup>3</sup>. It is a key ingredient of force protection<sup>4</sup>. J-SEAD is a broad term encompassing

all SEAD activities provided by the service components of a joint force in support of one another. J-SEAD can use destructive or disruptive means to meet objectives<sup>5</sup>. Destructive means seek to destroy target systems or operating personnel. Destructive J-SEAD missions use general-purpose (GP) bombs, laser-guided bombs (LGBs), global-positioning system (GPS)-based weapons and area munitions to attack targets. Disruptive means temporarily deny, degrade, deceive, delay, or neutralize enemy air defense systems. Disruptive means are often temporary in nature and can be either active or passive. Active disruptive measures include electronic attack, jamming, and expendables (chaff and flares). Passive measures include emission control, camouflage, and stealth<sup>6</sup>. All of these types of SEAD are evident in modern conflict to include Desert Storm and most recently Kosovo.

According to Joint Pub 3-01.4, Joint Tactics, Techniques, and Procedures (JTTP) for J-SEAD, J-SEAD needs to be an integral part of the planning for joint air operations. The Joint Chiefs of Staff add that we must integrate joint forces without exposing weak points or seams that could either increase risk to friendly forces or reduce risk to enemy forces<sup>7</sup>.

These statements dictate the requirement for clear J-SEAD doctrine, an understanding of Joint Task Force (JTF)

SEAD capabilities, needs, and the ability to integrate the potential of particular combat systems. These areas are the focus of the primary and secondary research questions. The primary research question is what obstacles in J-SEAD doctrine, capabilities and integration must the JFC cope with to conduct J-SEAD operations? To support this question the secondary research questions address whether or not the individual service doctrine supports joint doctrine. What is the common SEAD systems availability to the JFC? And is there a coordinated effort in place to integrate the individual services' contribution to the total J-SEAD effort? Together the answers to these questions provide a foundation to advance J-SEAD.

Our experience in Operation Allied Force re-emphasized the importance of having a comprehensive air-defense suppression strategy. It is clear that all potential participants in J-SEAD need to develop appropriate air defense suppression capabilities for a variety of reasons. First, to improve service integration and synergy enhancing success in future operations. Second, to ensure the Armed Services are meeting Title 10 responsibilities of providing capable and trained forces that meet the needs of the combat commanders. Finally, to provide aircrews the best protection possible by minimizing the inherent risks in

modern battlespace that is rampant with Integrated Air Defense System (IADS) proliferation.

## **II. METHODOLOGY**

An understanding of J-SEAD doctrine, SEAD asset capabilities, and J-SEAD integration issues are key in forming the basis of this monograph. An extensive search for sources at Air University Library was conducted to determine the magnitude and quality of the information available. The initial research and topic familiarization centered around the subject areas of J-SEAD doctrine, common SEAD weapons systems, current enemy air defense threats, and integration matters pertaining to the JFC in the role of overseeing J-SEAD employment. The research provided the content necessary to develop the following chapters.

Chapter one introduces the topic of the monograph and provides necessary background information including the significance of the topic to the joint environment. Chapter two explains the methodology necessary to successfully answer the primary and secondary research questions. Chapter three presents the research pertaining to J-SEAD doctrine, assets, and their current capabilities available to a JFC. It also introduces some of the more obvious integration issues influencing J-SEAD. Chapter four then reviews the disparities in doctrine, highlights gaps in capabilities and discusses integration hurdles. Potential

weak areas pertaining to doctrine, capabilities and integration that the JFC must contend with become apparent. This analysis provides an increased awareness and footing for improving the aptitude of the JFC to prosecute future J-SEAD operations. Ultimately, the ability to recognize potential problem areas in J-SEAD doctrine, resourcing, and integration is where this monograph gains value. Chapter five concludes the monograph summarizing the key points and suggesting areas for improvement.

### III. RESEARCH AND ANALYSIS

*Joint doctrine is primarily based upon single-service SEAD employment instead of J-SEAD employment...Joint doctrine treats SEAD as though it is synonymous with J-SEAD. The only distinction being the number of services participating in the SEAD campaign.*

-Lt. Colonel Jon A. Norman  
F-16CJ Instructor/CGSC Graduate<sup>8</sup>.

The initial research examines what current guidance J-SEAD doctrine provides and if service component SEAD is compatible and compliant with joint doctrine. The overriding joint publication that addresses the topic of J-SEAD is Joint Publication (JP) 3-01.4, Joint Tactics, Techniques, and Procedures for J-SEAD. The focus of JP 3-01.4 is primarily on J-SEAD planning, coordination, and command and control (C2) responsibilities. Specifically, the areas of C2, planning, and execution form the framework to determine the compatibility issues and differences that



exist. These areas outline the review for all of the SEAD doctrine that follows.

### ***Joint Doctrine***

According to JP 3-01.4, the JFC establishes the requirements for J-SEAD to facilitate the joint operation or campaign<sup>9</sup>. The JFC has full authority to organize and employ those forces as necessary to accomplish the mission. Doctrinally the JFC has the liberty to organize and shape areas of responsibility (AOR) as seen fit to fulfill military objectives<sup>10</sup>. Joint doctrine describes other key areas that the JFC must consider. These include developing objectives and command guidance for J-SEAD operations, assisting in establishing areas of control, and clarifying command relationships specifically, the supporting and supported commanders for land, sea, and air within the JOA<sup>11</sup>. To assist with duties, the JFC is empowered to set up a staff to assist in the J-SEAD effort.

JP 3-01.4 explains how the JFC assembles an electronic warfare staff and defines the roles of key staff members<sup>12</sup>. The key members of the JFC's staff that participate in J-SEAD support are the intelligence (J-2) and operations (J-3) staff members. The J-2's major responsibilities include the commander's critical information requirements (CCIR) and continuous coordination with the J-3 and JFACC to ensure the mission objectives are met<sup>13</sup>. The J-3 duties, beyond course

of action development, are dependent on the role the JFC establishes. This leaves substantial leeway for the JFC's personal experience and initiative. This flexibility is apparent in determining the capacity of the joint targeting coordination board (JTCB) to establish targeting guidance and priorities. Where the JTCB exists within the organization, who chairs it, and how it functions within the process are other tasks the JFC must assign<sup>14</sup>. The JFC normally designates a joint force air component commander (JFACC) who is assigned responsibility for the coordination and planning for AOR/JOA SEAD<sup>15</sup>. The JFACC usually absorbs the responsibilities of the JTCB. The JFACC is often best suited to do this and lead the overall J-SEAD effort as it is a sub-mission of counter-air operations. Additionally, the designated JFACC's service usually contributes the preponderance of J-SEAD assets<sup>16</sup>. Desert Storm supports this position as acknowledged by General Colin Powell who praised the JFACC's role in Desert Storm by stating it set the standard for future warfare<sup>17</sup>. In theory, the Joint Force Land Component Commander (JFLCC) may also fill this role but this option has not been practiced in the past decade. Regardless of the designated command structure, the JFACC has been delegated substantial responsibility in the J-SEAD arena including critical planning<sup>18</sup>.

There are three primary objectives for planning J-SEAD in support of air operations: (1) Accomplish an accurate appraisal of enemy air defenses and their ability to influence the outcome of overall air operations. (2) Decide on the scope, magnitude, and duration of SEAD operations necessary to reduce enemy air defense capabilities to acceptable risk levels. (3) Determine the capabilities of available suppression assets, as well as potential competing requirements for these forces<sup>19</sup>.

The J-3 planners lead COA development to accomplish the overall mission objectives. With each COA there is supposed to be a corresponding SEAD concept. Often the JFACC is responsible for the complementary SEAD COA<sup>20</sup>. Based on JFC guidance, the component commanders are responsible for detailed mission planning and execution of J-SEAD operations<sup>21</sup>. Overall, the planning process should follow the military decision making process (MDMP) model.

Establishing the boundaries within the joint operations area (JOA) is another critical JFC responsibility that influences both planning and execution. Typically, the most important boundary is the fire support coordination line (FSCL). Beyond this area is where the JFACC often spends the preponderance of effort. The area between the FSCL and the forward line of troops (FLOT) is traditionally under the control of the land component commander (LCC). This area,

which extends to the forward AO boundary, requires interpretation and clarification by the JFC as it directly affects execution<sup>22</sup>.

During execution each component has its own unique ability to conduct SEAD. No single service possesses the assets to act autonomously. The J-SEAD challenge is to choose the best means and ways to conduct particular J-SEAD operations from the limited array of available options. Ultimately, execution of J-SEAD requires a thorough and common understanding of the enemy's IADS. To do this the JFC must continually monitor SEAD success relative to the overall campaign plan<sup>23</sup>.

Joint doctrine dictates the following three types of J-SEAD execution operations: AOR/JOA air defense system suppression, localized suppression, and opportune suppression. Ultimately, the J-SEAD missions and procedures increase the effectiveness of all the theater operations, minimize duplication of effort, and promote responsiveness<sup>24</sup>. A look at the individual service component doctrine in the context of C2, planning and execution and how it promotes the J-SEAD effort is the next logical area for discussion.

#### ***Air Force Doctrine***

The Air Force SEAD program is coordinated from the air operations center (AOC). The AOC allocates forces, matches

targets to missions, and deconflicts air operations through the air tasking order (ATO)<sup>25</sup>. The ATO is the key C2 piece that directs the SEAD units to conduct operations to support the other ATO missions throughout the boundaries of the JOA. Upon receipt of the ATO, the individual units, in orchestration with the airborne C2 assets, retain responsibility for ensuring ATO fulfillment. If the tasking is not on the ATO, then higher level coordination, a non-standard procedure, is necessary to ensure adequate planning.

Air Force units are proficient at the tactical planning of SEAD missions. Through close coordination with the electronic warfare (EW) experts on the JFACC's staff, the operational units ensure proper tasking thus making tactical execution feasible. Usually the ATO dictates an Air Force F-16 HARM targeting system (HTS) pilot as the overall EW mission commander (MC). The EW MC assists with the ATO coordination process and makes in-flight tactical decisions to ensure mission success. Operationally, the Air Force typically writes fixed-wing execution guidance in the form of standard operating procedures (SOP) for each operation it is involved with. The SOPs contain threads of continuity but they are adjusted on a case-by-case basis depending on environment<sup>26</sup>.

The evolution in SEAD employment doctrine that has occurred over the past decade continues to accelerate as the technology-based systems continue to improve and mature. Today, USAF F-16 J-SEAD doctrine is dominated by the two primary joint suppression methods, destruction and disruptive means, to fill J-SEAD missions. The execution of doctrine is dynamic and changes with the environment but in each case the span of operations is functionally aligned to operate at the strategic, operational, or tactical level as necessary throughout the JOA<sup>27</sup>. The tactics are often very dependent on the rules of engagement for the JOA<sup>29</sup>.

#### ***Army Doctrine***

The Army's operations staff operates under centralized control but is capable of independent actions in some scenarios. The Army is a firm believer that the LCC should control of all activities within the AO<sup>30</sup>. Under the LCC, the (G3) is responsible for SEAD operations. The G3 delegates lethal and non-lethal fires to the fire support element (FSE)<sup>31</sup>. These categories of fires equate to joint doctrine's destructive and disruptive means. The enemy electronic order of battle (EOB) and EW support development are managed by the intelligence staff (G2)<sup>32</sup>.

Planning is critical to any Army operation. Formal doctrine is normally very specific but SEAD planning doctrine tends to lag prevailing technologies. The doctrine

still has clear links to the Air Land Battle concept that suggests breaking up the battlespace with lines separating responsibility<sup>33</sup>. Interestingly, some publications that would appear to have a clear need for addressing J-SEAD are clearly void of any discussion. For example, FM 2-20-40, Tactics, Techniques, and Procedures for Fire Support for Brigade operations (HEAVY), does not address either SEAD or J-SEAD. FM 6-20-30, Tactics, Techniques, and Procedures for Fire Support for Corps and Division Operations, only addresses J-SEAD in its appendix B. On a promising note, the Army and Marine Corps Integration (AMCI) in Joint Operations manual, dated May 1996 describes multi-service tactics, techniques, and procedures (TTPs) for joint operations execution<sup>34</sup>.

The Army's view of SEAD campaign execution is primarily preplanned missions for air assets that may be threatened by tactical air defense systems. The principal Army suppression weapons are the multiple rocket launched system (MRLS) and 155-millimeter Howitzer that use destructive means to fulfill their roles<sup>35</sup>. Additionally, Special Forces, attack helicopters, and electronic jamming are other means the Army conducts SEAD with<sup>35</sup>. The Army's arsenal of ground-based SEAD assets provides substantial potential to the joint fight, however, the Army's concept of J-SEAD primarily focuses on separate single-service SEAD operations

deconflicted by physical boundaries or time<sup>36</sup>. This approach can be effective but it limits employment options particularly when theater assets are finite, as is the case with SEAD weapon systems.

Army SEAD targets are reactively targeted when the fire support element (FSE) receives a SEAD fire request. Proactive templated targeting also occurs but is not a desirable option from the fire support perspective. The surface-launched reactive and preplanned suppression fires have substantial destructive potential but limited success due to the FSE's inability to locate, target, and refine fires in real-time against mobile surface to air systems (SAMS) and anti-aircraft artillery (AAA)<sup>37</sup>.

#### ***Navy Doctrine***

The Navy stresses decentralized and independent C2. The surface warfare commander (SWC) has complete tasking authority over all naval SEAD assets<sup>38</sup>. Once fleet defense is assured, the Navy allocates the preponderance of its excess airborne SEAD forces to the JFC's effort. The Navy is a proponent of and active participant in JFACC lead operations<sup>39</sup>.

Naval doctrine coincides with its war-fighting mentality of independent operations. NWP-1, Strategic Concepts of the US Navy, explains that they have primarily a raid mentality and secondarily, a limited campaign focus.



The doctrine is very general thus, tactics are formulated on a case-by-case basis. This fosters flexibility but frustrates strategists who try to plan larger scale operations. The planning focus is clearly towards threats to the fleet. The overall IADS is not as much a concern as the specific area of attack<sup>40</sup>.

In general, naval aircraft and weapons are designed to execute multi-purpose operations. The SEAD tactics typically focus on "corridor clearing" to open a path for attacking aircraft or specific target-area suppression for a very limited geographic area<sup>41</sup>. Disruptive suppression is the emphasis with destruction being secondary. This approach compliments the limited objectives the Navy is designed to fulfill. It also offers substantial capability to the J-SEAD campaign when assets are made available to the JFC.

#### **Marine Doctrine**

The commander, amphibious task force (CATF), has overall control of the landing force and all its naval air and artillery support. After establishing C2 facilities ashore, the commander landing force (CLF) assumes responsibility for these operations. The Marine air-ground task force (MAGTAF) commander is the CLF. Marine artillery support for SEAD is managed through a fire support coordination center (FSCC). Their air operations are

managed separately through an air combat element (ACE). Support and planning responsibilities transcend two staff structures during a landing operation. Once ashore, SEAD operations are conducted in support of both close and deep Marine operations. Similar to the Army, the Marine EW assets are controlled by their respective intelligence division's J2<sup>42</sup>.

The Marines approach SEAD planning as they would for any fire support mission. The requests are processed through the fire support channels and coordinated at higher echelons<sup>43</sup>. When a SEAD request reaches the Marine tactical air command center (TACC) the ACE decides if the request is resourced. The ACE, in coordination with the ground combat element (GCE) ultimately does most of the SEAD planning. Their planning responsibilities include eight areas of which the last one is involves participating in J-SEAD planning<sup>44</sup>.

The goal of MAGTF SEAD execution is the accomplishment of the supported mission. Key in execution is intelligence collection, dissemination and targeting. The Marine air command and control system (MACCS) agencies are integral in the collection and exchanges of enemy air defense information<sup>45</sup>. The success of the Marine SEAD effort appears dependent on the MACCS's ability to ensure a timely and accurate information flow. Each mission is executed as a separate tactical problem that is dependent on the

environment and specific conditions. Marines use a combined arms approach with any combination of aircraft, direct and indirect fires, or ground forces necessary to fill the mission.

The Joint and individual service component doctrine previously discussed form critical bedrock for J-SEAD as it captures the thoughts and employment visions of many independent persons interested in SEAD. Implementing ideas into solutions for the JFC is where the J-SEAD effort is won or lost. Before this can be done, a discussion of the equipment and capabilities the individual service components bring to the fight is necessary to build a complete picture of the JFC's J-SEAD challenges.

#### ***Equipment and Capabilities***

This section expands on each of the individual service's key system contributions to the JFC's J-SEAD effort. A brief description of the systems, their unique qualities, what threats they are optimized for, their weak areas and other pertinent facts are expanded upon. The list is not exclusive and necessarily avoids classified capabilities and issues, however it does provide a basis to analyze the common tools available to the JFC to prosecute the J-SEAD mission.

## **Air Force**

The HARM targeting system (HTS) is an USAF F-16 specific system that scans an area, analyzes received frequencies, wavelengths, and pulsewidths of enemy-generated radar beams and microwave energy. Then, the HTS classifies the threats, identifies them, and presents the information to the pilot on his multifunction display for tactical interpretation<sup>46</sup>. The F-16 HTS, referred to as the F-16CJ is the only aircraft that is capable of autonomous precision location, emitter identification, and targeting of fixed and mobile SAMS and AAA radars. The USAF F-16CJ possesses a unique range-known reactive and preplanned targeting capability allowing this weapon system to support opportune and localized SEAD missions. The F-16 HTS aircraft have the capability to data link SEAD targeting information to other internal data modem (IDM) equipped platforms or relay threat location information using voice communications to any compatible radio system<sup>47</sup>. This capability is critical for the integration of F-16CJs into the electronic triad.

The electronic triad is a new technologically based employment concept that has evolved ahead of its doctrine. The triad contains a combination of the RC-135 Rivet Joint (RJ), the E-3 Sentry airborne warning and control system (AWACS), and the E-8C Joint Surveillance Target Attack Radar System (JSTARS). These SEAD enablers provide information

superiority: the RJ through on-board linguists and electronic intelligence (ELINT) sensors, the AWACS for air surveillance and command and control, and the JSTARS for ground surveillance<sup>48</sup>. The electronic triad has premier capability against enemy systems that omit electromagnetic energy or communicate via airwaves. Together these systems provide critical information for the SEAD platforms so they can prosecute an uncooperative and dynamic enemy IADS.

Unmanned aerial vehicles (UAVs) and satellite-based platforms are also integral to the Air Forces ELINT effort. Although much of the information pertaining to this topic is "leading edge" and thus classified, the information provided by the unmanned systems is important to the warfighter's efforts. In some cases, the air and space-born sensors use visual means to help confirm or identify enemy air defense locations. The unmanned sensors can be retrofitted to receive all significant ELINT used to help build the dynamic electronic order of battle (EOB) which is critical to the SEAD warfighter<sup>49</sup>. The EOB is the SEAD unique portion of the intelligence preparation of the battlefield (IPB). The UAV and space experts are embedded and conductivity is established in any scenario that the Air Force conducts SEAD<sup>50</sup>.

Besides the primary SEAD platforms, key to the Air Force's employment are its active weapons and passive

measures. The active systems include AGM-88 high-speed anti radiation missile (HARM), self-protection jamming, decoys, chaff and flare, and tactics<sup>51</sup>.

An expanded discussion of an active weapon, the HARM, is appropriate as it is the principal joint weapon used against mobile radar guided threats. The HARM homes in on the source of the designated radar emission and flies to the site as long as it is emitting electrons. The HARM's speed is such that it can arrive at mobile sites before they move. The speed comes with the cost of a reduced warhead typically only allowing the disruption option for targeting enemy systems<sup>52</sup>.

Passive measures are becoming increasingly important in modern conflict. Passive measures are typically built-in survivability traits that protect individual assets. The reason for the increase is because of the proliferation of man portable air defense systems (manpads) and the reality that systems that you do not know about are the ones that will hit you. Passive measures include emissions control, camouflage, infrared shielding, and radar absorbing materials<sup>53</sup>. These measures are used in varying degrees by each of the services.

#### **Army**

The 155mm Howitzer makes up the majority of the Army's ground based SEAD contribution<sup>54</sup>. The self-propelled 155mm

is a mature weapon system that has undergone continuous improvement during its forty-year life span. Given accurate target information, the 155mm delivers a variety of ordnance with lethal destructive results on a myriad of targets within a thirty-kilometer range. Currently, the 155mm Howitzer's limitations include its strategic mobility, munitions consumption, and lack of precision<sup>55</sup>. The 155mm Howitzer's quantity is augmented by the quality of the multiple launch rocket system (MLRS).

The 227mm MLRS was designed as a low-cost rocket delivery system whose munitions are handled like conventional ammunition with similarly high rates of fire. The lightly armored M270 self-propelled launcher is a stretched version of a M2 Bradley. A three-man crew operates an advanced fire control computer system that fires twelve rockets of varying types at ranges up to forty kilometers<sup>56</sup>. The area munitions can destroy targets with ease if given accurate target coordinates. An advanced version of the MLRS is the Army tactical missile system (ATACMS). The ATACMS, a M270 launcher modified with two rocket launchers for extended range targets uses off-axis guidance techniques to prevent enemy radar from plotting the friendly launch point. The ATACMS provides the JFC with GPS aided accuracy out to 500 kilometers depending on the submunition. The ATACMS proved to be a superb SEAD asset in

Desert Storm when combined with JSTARS. By the use of near real-time ELINT and radar information, the ATACMS-JSTARS team locates, targets, and kills enemy SAM sites<sup>57</sup>.

The Army Special Forces (SF) offer the JFC flexibility and responsiveness in that they are often the first forces in theater and they can be used against a variety of SEAD targets. SF are highly trained in direct action operations. This capability can be used against a medley of targets to include individual manpad positions or against strategic SAM sites. Due to risk and political sensitivities, the JFC's use of SF in SEAD operations tends to be qualitative versus quantitative in nature<sup>58</sup>.

The Army's most effective reactive SEAD weapon system is the Apache Longbow helicopter armed with hellfire missiles<sup>59</sup>. The Longbow is a modified AH-64A equipped with a mast-mounted AN/APG-78 Longbow millimeter-wave radar and Hellfire missile with radio frequency (RF) seeker. The Longbow has completed successful testing where it tracked and subsequently destroyed moving targets at a variety of ranges when working in coordination with JSTARS via digital data modem<sup>60</sup>. The Longbow is more survivable than most helicopters because of its enhanced active and passive self-defense systems. The longbow has the potential to survive high threat low-level night operations against sites having identifiable hardware such as a radar antenna or trailer



system. Ultimately, the success of Longbow missions depends on the accuracy and timeliness of target locations<sup>61</sup>.

### **Naval**

The Navy and the Marine SEAD assets are discussed together because their systems are similar to each other or they have been previously covered in the Air Force or Army sections. Besides their jamming capability, the primary SEAD weapon for the naval systems is the HARM. The Marines offer the additional ground capability with additional 155mm Howitzers that are similar to the Army's in capability and doctrine. In general, the main difference between the Marine Corps and Navy SEAD assets is that the Marine assets are primarily dedicated to ground forces<sup>62</sup>.

The Naval EA-6B Prowler is the armed services premier radar-jamming platform. The four-crew aircraft is the most advanced joint electronic jammer. It can be programmed to suppress a variety of radar dependent threats on a defined threat axis<sup>63</sup>. The EA-6B can carry a HARM for lethal suppression however, this results in the loss of an external jamming station<sup>64</sup>. The EA-6B is a numerically limited SEAD asset that in most scenarios is a go-no-go item for air operations<sup>65</sup>.

The F-18 Hornet is a naval workhorse and their second most important contribution to the J-SEAD puzzle. The F-18 is a credible HARM platform although its ability to

autonomously pinpoint enemy emitter locations is non-existent. The F-18 typically comes equipped with a self-protection electronic jammer, chaff and flare dispensers, and the ability to drop precision munitions in destruction type scenarios. The Hornet offers the unique ability to carry tactical air-launched decoys (TALDs) to stimulate enemy IADs<sup>66</sup>.

The cruise missile is a JFC asset that has received much publicity in the last few years. The Navy's Tomahawk is the most commonly known version, and is similar to the Air Forces air launched cruise missile (ALCM). This long slim cylinder is divided into five sections to include a GPS guidance section, fuel for extend range launches, and an ordnance section<sup>67</sup>. The TLAM-D, with its combined effects munitions is the version most likely to be employed against a SEAD target set. Cost and finite numbers are the major curb to the benefits of the cruise missile's precision-like accuracy and tremendous standoff range. Because of limited numbers, it is traditionally employed early in the SEAD campaign against higher risk, fixed SAM sites where the benefits of the mission justify the use of this valuable asset.

Both naval services offer ground forces abilities similar to the Army's SF. The Navy's sea air land teams

(SEALS) and Marine infantry units execute these special missions when called upon.

### ***Integration***

#### **Air Force**

Operation Allied Force made it clear that there are now haves and have-nots among tactical air forces. The USAF is clearly leading the haves with such advances as in precision, UAVs and the electronic triad's information flow<sup>68</sup>. The USAF's technical promiscuity has both a good and bad side. The good is obvious in that it offers our forces a clear advantage. The bad side is that it makes a vast quantity of previously proven or potentially useful weapons systems, essentially obsolete or certainly less relevant. This is in part because of the new expectations of low collateral damage and minimal casualties brought about with the military successes in the past decade. Additionally, the USAF usually attempts to make new systems compatible with older systems. Each new piece of equipment typically only adds to the overall integration challenge<sup>69</sup>. Beside technological integration problems, there are also organizational hurdles.

USAF warfighters at the tactical level do not have direct contact with the typical sister service elements they need in order to orchestrate the Air Force portion of an effective J-SEAD campaign. With the Army, the Air Force

must coordinate plans, procedures, and tactics through the AOC to the battlefield coordination detachment (BCD) to the G3, G2, and FSE. The AOC coordinates with the Army through the BCD for close operations and deep operations involving Army assets. The layers of non-warfighters between the airmen and soldiers who execute the mission orders can add confusion to the process and limits the tactical exchange necessary for land-air advances.

The case of J-SEAD training with the Navy is not as dire but the only dedicated USAF-Navy J-SEAD training has occurred between EA-6B aircraft and F-16 SEAD units at Air Combat Command (ACC) managed Green Flag exercises<sup>70</sup>. This training, combined with the real-world contingency schedule provides work around solutions to tactics and system disparities as well as a broad short-term experience base.

#### **Army**

Army doctrine makes their strategic and operational planning the most thorough of all the services but this tends to stifle tactical flexibility in a dynamic J-SEAD campaign where the threat tactics, capabilities, and employment vary daily. Furthermore, the Army's concept of SEAD varies significantly from the Air Force and the Navy. The Army's focus is necessarily weighted on threats influencing surface operations. The land-centric view is embedded in their doctrine, training and systems thus

complicating the integration process. At the Army's Battle Command Training Program (BCTP) exercises and at the Army Command and General Staff College, the SEAD effort is under emphasized, assumed away, or otherwise not addressed<sup>71</sup>.

Fortunately, the Army is involved in several Joint Task Force Exercises (JTFEX) incorporating limited tactical level J-SEAD training. The focus at the JTFEX is mainly on battle staff training and does not get into the technical issues surrounding integration<sup>72</sup>. Overall, although the Army does participate in limited J-SEAD training scenarios their integration with the sister services lags behind the other armed components. Still today there are no J-SEAD JTTPs or J-SEAD communication procedures for joint missions inside or beyond FSCL<sup>73</sup>.

### **Navy**

The Navy and Air Force have formed a close working relationship in J-SEAD operations. The evolving tactical doctrine of both services tends to employ a "joint" air-naval flavor because of the necessary interdependence of the service's assets. One integration success story is the joint EA-6B squadrons manned by the Navy and the Air Force. Established in 1996 to help counter the retirement of the Air Force's sole jamming platform the EF-111 Raven, the EA-6B is the dedicated joint-service tactical jammer<sup>74</sup>. The EA-6B squadron is typically manned by approximately 25% of

Air Force crews and recently the first EA-6B command billet was filled by an Air Force Lieutenant Colonel<sup>75</sup>.

### **Marines**

The Marine SEAD effort pivots on the connectivity with the other services ELINT collection systems. The Marine collection and exchange of enemy IADS information depends on the MACCS's ability to ensure a timely and accurate information flow<sup>76</sup>. Unless specifically task organized for a specific operation, they are not likely to have access to all the ELINT that their systems need to optimize performance.

The Marine Corps believe that their pilots are prepared for J-SEAD employment based on their combined arms single-service SEAD training they receive<sup>77</sup>. Fortunately, the Marine fixed wing assets have a good working knowledge and proven record in JFACC run SEAD operations. Continual deployments to the Balkans and over Iraq provide a firm foundation of experience to help smooth compatibility issues.

It is imperative that the Marine Corps, Navy, Army and USAF planners coordinate within their four organizations to ensure synergy in J-SEAD plans. The service's doctrinal differences, clear gaps in SEAD capabilities, the uniqueness of each JTF, and the means which the JFC organizes force necessitates inter service communication at the tactical

planning level. This coordination often occurs because of the efforts of the warfighters but is not standardized, clear in doctrine, or trained to<sup>78</sup>. To compound the problem many units have not been afforded J-SEAD training opportunities and most do not have established JTTPs<sup>79</sup>. The fact is that these exercises are usually short-changed due to lack of service participation for a variety of reasons to include the high operations tempo of some key SEAD assets, training dollars, and the priority the services assign to J-SEAD training.

#### IV. IMPROVING J-SEAD

*"SEAD is one of most important missions we have in the Air Force. It opens doors for all other forces to do their work".*

-General Richard E. Hawley  
Air Combat Commander in 1998<sup>80</sup>

This section begins with the realization that improving J-SEAD is accomplished by analyzing the research pertaining to J-SEAD doctrine, capabilities, and integration. In each of the J-SEAD areas previously mentioned there are key topics that need the JFC's attention. Some areas are identified but they should not be considered complete. The dynamics of each scenario will change the topics of emphasis and highlight other areas for concern.

### **Doctrine**

Current SEAD doctrine is not consistent nor does it provide clear guidance to focus the individual services J-SEAD effort. The review of joint doctrine and the service's SEAD doctrine reveals examples in C2, planning, and execution that need refinement.

Contemporary joint doctrine relies too much on the JFC's understanding of J-SEAD and background to succeed in modern combat operations. Joint doctrine can not be faulted for constraining the JFC's options for J-SEAD. Some argue it gives too much flexibility and latitude. The non-prohibiting guidance may contribute to the service component's differences and add to the misdirection that exists<sup>81</sup>. The key staff members that the JFC assigns and describes duties for must be well versed in J-SEAD for the J-SEAD concept to succeed. Often the staffs are put together adhoc. With the rapid advances in technology and the technical expertise necessary, only a small number of officers possess the SEAD knowledge essential for these key roles. As a minimum, an expert from each battlespace operating system (BOS) should augment the JFC's staff.

Although apparently successful in Desert Storm and Operation Allied Force, the trend of placing the JFACC in charge of the J-SEAD effort causes concern for some of the services. This concern centers on three command issues



specifically, the control of assets, the supported or supporting commander role, and the functional versus boundary view of battlespace. Joint doctrine and service component doctrine are not complimentary on these issues.

Fundamental differences exist between the way a typical JFACC and the way Army aviation approach tactical problems. For example, due to the apparent risk in low level operations, the JFACC elected not to use Army aviation in Kosovo considering the threats they would encounter and the relative payoff of the purposed armor targets<sup>82</sup>. The Army's view of low altitude operations is significantly different. Their funding of current attack aviation assets supports their belief that the advantages of low altitude operations outweigh the risks. The ultimate decision highlights the potential problems over the control of assets. Interestingly, in this case the JFACC was not in charge of the assets but the JFACC's stance on the issue was elected.

The inconsistency in service descriptions of joint fires and battlespace makes debate over joint fires coordination difficult<sup>83</sup>. The cross-boundary joint fires coordination problem is intense between the FSCL and LLC's forward boundary because both supported commanders in the close and deep battles have time-sensitive missions<sup>84</sup>. The SEAD threat does not comply with the self-imposed borders on the ground. The limited SEAD assets, with their functional

capability naturally facilitate the need for coordination measures to allow cross-border employment. The realization that battlespace can not always be dissected into smaller boxes controlled by separate commanders is particularly true when the commanders have nominal control over the actions of the threat that must be overcome.

JP 3-01.4 is misleading in its description of the J-SEAD planning and execution process. Readers unfamiliar with operational J-SEAD mission employment are led to believe that the JFC, J-3, JFACC, and other component commanders conduct all J-SEAD mission planning and execution. J-SEAD TTPs found in JP 3-01.4 attempt to separate the warfighters from the planning process. AOR/JOA air defense system suppression, localized suppression, and opportune suppression all require close coordination between operators and battle managers. Battle managers rely upon the unique expertise of each operational element of the J-SEAD force structure to provide realistic employment tasking. Operators rely upon battle management guidance for force allocation, ROE, and targeting priorities. Battle managers are best suited for high-level coordination necessary to task J-SEAD forces. Battle managers do not have the experience, competency, or manning to accomplish everything that JP 3-01.4 states they do<sup>85</sup>. Fortunately, the responsibility for SEAD planning is normally delegated

to the EC package commander through the ATO. The EC package commander and the forces participating in the mission conduct the detailed mission planning. Unfortunately, with delegation comes dilution. If forces are not on the ATO, then in most cases they are not considered and thus are not integrated into the planning. Information flow also tends to lose effectiveness with lower level delegation.

JP 3-01.4 does not address how all the J-SEAD players are going to get the same information to conduct parallel planning for synchronized operations. Furthermore, it does not address the operational information requirements for J-SEAD operators<sup>86</sup>. The warfighters currently do not have the same connectivity as the battle managers. They have very little exposure to the J-SEAD planning data that is available to the JFC's staff. This fact is true for all the individual service staffs and has a direct effect on the primary SEAD mission commanders, the USAF F-16 SEAD pilots and their requests for intelligence<sup>87</sup>. The mission planning and execution responsibilities should continue to be delegated down to the warfighters however, the warfighters planning must be properly supported from the higher echelons in terms of information flow and C2 to successfully wage the J-SEAD campaign. Until a better system is implemented, the use of the ATO is the best solution for ensuring positive C2.

Another doctrinal problem influencing execution is that joint doctrine classifies J-SEAD separate from EW<sup>88</sup>. The problem with this is that critical assets may not be properly apportioned or assigned to a common mission if the terminology is not accurate. Confusion and unity of effort are difficult to achieve if the services can not agree on which assets are going to contribute to J-SEAD. If this execution problem is overcome, the individual services still add their own nuances to the problem.

Air Force doctrine is classified and tends to lag behind their current employment methods at the tactical level. This is due in part to the Air Forces reliance on technology and willingness to integrate it at anytime. The Air Force's approach does not facilitate a common understanding and makes it difficult to enhance J-SEAD integration.

The Army has several doctrinal additions that hinder J-SEAD employment. First, there is the separation of the EW and SEAD missions and the responsibilities of each. Having the G2 in lead of EW effort waters the weight of such an effort since the G3 will ultimately have to execute the G2's plan. Furthermore, the Army doctrine tends to be dated pertaining to the current technologies and political realities. The basic employment concept to fire on templated or postulated threat sites, a method common to

support aviation is antiquated considering the detection systems now available let alone the evolution of precision employment and the constraints minimizing collateral damage. Finally, the Army's reliance on ground based boundaries goes against the concept of three-dimensional battlespace acknowledged in Joint Pub 3.0 and the functional capabilities of the limited SEAD assets available<sup>89</sup>. Although necessary in some cases such as unit security, the boundaries that were designed to aid in controlling resources, is a hindrance to a J-SEAD operation.

The Navy's lack of SEAD doctrine has the benefit of lowering the impact its doctrine has on the joint fight. The Navy uses its flexible approach to employment and multi-purpose systems effectively to become a key J-SEAD contributor. The flexible approach and multi-purpose designs have the drawbacks that they often curtail sophisticated specialization in tactics or capabilities that can be a virtue in high-tech SEAD operations.

Doctrinally the Marines are closest to the Army. Their EW operations are under the G2 potentially reducing their impact and their artillery methods resemble the Army's. The doctrine has a clear Marine-centric focus however in reality the Marines have shown the same adaptability as the Navy with their fixed wing assets tactical doctrine. Marine SEAD doctrine is somewhat dated but is undergoing a complete

rewrite. A new publication that reflects current employment methods is available in draft format<sup>90</sup>.

### ***Integration of Equipment and Capabilities***

The fact is SEAD assets are finite and that no single service can conduct SEAD alone except in limited scenarios. Additionally, the current SEAD assets do not cover the full-spectrum of SEAD type threats. There are major gaps in capabilities versus historically prevalent threats. The capability against less mobile radar dependent technologies such as the SA-2 or SA-3 is excellent. If the radar is mobile such as the SA-6, the SEAD options become limited. The ability to disrupt enemy IADS still exists but the destruction alternative is greatly reduced. If the enemy system is optically launched then only on-board passive measures, avoidance, or aircraft maneuvers can consistently defeat the threat<sup>91</sup>. Optical launched threats such as manpads and a vast variety of AAA makes up the majority of enemy IADS. The United States acknowledged this fact in Operation Allied Force as low altitude operations were not seen as essential enough to allow sustained operations below 15,000 feet<sup>92</sup>. This realization highlights the need to integrate the variety of individual service systems. Currently, not all of the primary SEAD systems are able to work together even if the doctrine stressed coordination.

General Ryan, the Air Force Chief of Staff, recognizes the integration problem. According to General Ryan, the Air Force, Navy, and Marines are committed to the Link 16 data-sharing system. Link 16 permits different ships, aircraft, or facilities to exchange information from a variety of sources and sensors securely in real time. General Ryan explains how Link 16 makes it possible to "within minutes, retarget, refocus, and C2 the force". Unfortunately, delays in fielding have occurred due to a variety of reasons slowing the advance in SEAD integration<sup>93</sup>. The benefits of this responsive connectivity have been proven operationally on limited basis and can only enhance the JFC's future ability to coordinate and conduct a synchronized J-SEAD campaign.

General Ryan also addressed the overall lack of dedicated SEAD assets. The current SEAD air assets to include the Block 50 F-16CJ, the JSTARS, AWACS, RJ, and the EA-6B are all particularly hard hit by the current high operations tempo<sup>94</sup>. The old saying quantity has a quality of its own applies. Furthermore, the Air Force and Navy systems are focused on threats that can effect fixed wing aircraft. They have conceded most low altitude operations to the AAA threat. The vast majority of their capability is designed to suppress threats that can reach above 15,000 feet. The fixed-wing players doctrinally attempt to avoid

the lower altitudes while using on-board passive and active measure to increase survivability<sup>95</sup>. This leaves the Army and Marine systems to cover the lower altitude threats. Historically, the lower altitudes and the threats associated with the regime are where most aircraft are shot down<sup>96</sup>. The result: the Army, with the most aircraft of any service, persistently operates in this high threat region without reasonable J-SEAD support.

## V. CONCLUSIONS

*With ever increasing weapon capabilities, the cross-boundary (SEAD) problems are becoming increasingly acute.*

-Lt. Col. Robert J. D'Amico<sup>97</sup>

JFC's challenges for J-SEAD are substantial. Joint doctrine provides little assistance to the JFC except suggested means to structure organizations for conducting J-SEAD operations. The vague guidance opens concerns that center on the control of assets, the supported or supporting commander, and the functional versus boundary view of battlespace. Joint, Air Force, Army and naval doctrine all interpret these three key areas in a different manner<sup>98</sup>. Inconsistencies can be traced to the lead agent approach to joint doctrine production. The individual service's approach to SEAD are not consistent therefore rather than presenting warfighters with options, it presents them with confusion<sup>99</sup>. The result is increased risk of fratricide to ground forces and airborne assets.



Fortunately, doctrine provides the JFC sufficient leniency to "build" an organization as seen fit. To be effective this huge responsibility requires trusting delegation to SEAD experts or a JFC with the SEAD expertise. The fact is that no service can autonomously conduct effective sustained SEAD operations. The individual services appear to realize this but service component doctrine pertaining to integration appears slighted and in some cases void of the necessary measures to assist in overcoming this reality. The inability to conduct full-spectrum SEAD operations within any one service is clearer once you examine what capabilities each brings to the SEAD mission.

The Air Force gave up the closest thing to an autonomous SEAD capability with the retiring of the EF-111 standoff jammer<sup>100</sup>. Still the Air Force brings the most robust SEAD capability and the key information platforms to enable J-SEAD. Its bias towards technology is apparent in its meager capability against the numerically superior but technologically inferior systems such as manpads and non-radar guided AAA.

The Navy adds the critical joint jamming platform, the EA-6B, cruise missiles and a decoy capability. They also contribute additional HARM and PGM platforms but offer little except the Navy SEALs to counter low altitude threats

that have dominated air combat since Southeast Asia<sup>101</sup>. Together the Air Force and Navy fixed-wing and cruise missile team provides a highly effective SEAD capability against rigid IADS with radar dependent threat systems. In general, the Air Force and Navy SEAD assets were not designed against the threats that permeate in the low-altitude environment. Furthermore, the fixed-wing tactics they employ are predominately dependent on disruptive means that have vulnerabilities of their own as was apparent in Operation Allied Force.

The Army SEAD systems offer the best capability against the weakest link in current J-SEAD capability, the low altitude high quantity threats. The 155mm artillery, the MRLS, and longbow attack helicopter provide the JFC a balance of potential mass and precision. The Army SF also offer a unique but limited capability to shape battlespace. Overall, the Army systems offer the best immediate option to improve current J-SEAD performance against systems below 15,000 feet. Unfortunately, the integration of Army SEAD assets into J-SEAD has been slow due to a variety of reasons to include training, service biases, and doctrinal hurdles.

The Marine effort provides more capability across a broad spectrum and adds destructive potential via precision strike and the 155mm Howitzers but offers no new

capabilities. They also add additional EA-6B capability to the joint jamming mission.

Overcoming the service's interdependence in SEAD operations is critical. The integration must originate at the JFC level. An organization must be formed to optimize the limited resources and reduce the service component doctrinal differences. A clear and common EOB must be formed and disseminated to all the J-SEAD players. An unclouded chain of command with a knowledgeable J-SEAD staff is imperative to ensure that the joint assets are best used. Coordination means such as the ATO are necessary to resolve standardization dilemmas between the services. The SEAD fires must be integrated to ensure efficiency and deconflicted for safety. To do this the systems must be linked to communicate real-time. A shared secure communications capability must exist to allow a rapid and flexible response to the evolving SEAD threat. This need will necessarily eliminate the artificial prohibitions of battlespace borders that plague the current joint fires arguments. Once these changes are enforced, training must be increased to work out the idiosyncrasies that will certainly surface. Battlestaffs will need training on the means to dissemination ELINT between the warfighters and the battlestaff.

The JFC can circumnavigate the service component barriers by setting up a coordinated J-SEAD effort to make best use of limited SEAD assets available to him. The JFC will have to transcend resistance, well within authority, to conduct the type J-SEAD operations that will ensure future air domination. Until the doctrinal differences are resolved and the need to form a common J-SEAD effort is acknowledged, the JFC J-SEAD challenges will persist.

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<sup>1</sup> Air Force Magazine, August 1999, 25.

<sup>2</sup> Joint Chiefs of Staff, Joint Pub 1, Joint Warfare of the Armed Forces of the United States. (Washington DC: U.S Government Printing Office, 10 January 1995), i.

<sup>3</sup> Air Force Doctrine Document 1 (Maxwell AFB, Alabama: Headquarters Air Force Doctrine Center, 1997), 86.

<sup>4</sup> Air Force Magazine, August 1999, 24.

<sup>5</sup> Joint Chiefs of Staff, Joint Pub 3-01.4 JTTP for Joint Suppression of Enemy Air Defenses (J-SEAD), (Washington: U.S. Government Printing Office, 25 July 1995, V.

<sup>6</sup> Ibid, I-6.

<sup>7</sup> Christopher P. Gehler, "Unity of Effort: Crisis Beyond the FSCL" (draft monograph, School of Advanced Military Studies, Ft. Leavenworth, Kansas, 9 Dec 1999), 5.

<sup>8</sup> Jon A. Norman. "Air Force F-16 Joint Suppression of Enemy Air Defense Training: A Model For Operational Failure". (MMAS Thesis, Army Command and General Staff College, Ft. Leavenworth, Kansas 30 November 1999), 16.

<sup>9</sup> JP 3-01.4, all.

<sup>10</sup> Joint Chief of Staff, Joint Pub 1, Joint Warfare of the Armed Forces of the United States (Washington D. C.: U.S. Government Printing Office, 10 January 1995).

<sup>11</sup> Ibid.

<sup>12</sup> JP 3-01.4, II-1.

<sup>13</sup> Ibid.

<sup>14</sup> Ibid, II-3.

<sup>15</sup> Ibid, vii.

<sup>16</sup> AFDD-1, 46.

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<sup>17</sup> Joint Doctrine Air Campaign Course (JDACC), course notes, (Maxwell AFB, Alabama: Headquarters Air Force Doctrine Center, October 1999).

<sup>18</sup> Ibid. Numerous other sources used to form this position. The role of the JFACC in J-SEAD command, planning, and execution varies but in all cases, the role in contemporary warfare is significant and integral to mission success.

<sup>19</sup> JP 3-01.4, vi.

<sup>20</sup> Ibid, viii.

<sup>21</sup> Ibid, vii.

<sup>22</sup> Gehler. This observation was the author's interpretation of one of the key findings of Major Gehler's draft monograph. This view was confirmed in separate discussions with Major Gehler pertaining to the area of his subject matter expertise.

<sup>23</sup> JP 3-01.4, vii.

<sup>24</sup> Ibid, II-5.

<sup>25</sup> Norman, 60.

<sup>26</sup> This observation is based on the author's experience in the F-16 tactical community from 1990-1998.

<sup>27</sup> AFDD-1, 24.

<sup>28</sup> This observation is based on the author's experience in the F-16 tactical community from 1990-1998.

<sup>29</sup> Field Manual (FM) 100-5.

<sup>30</sup> Norman, 58.

<sup>31</sup> Ibid.

<sup>32</sup> This observation based on a thorough review of Army service and branch doctrine pertaining to SEAD, J-SEAD, and fire support. The average publication date of such materials is over six years old at the time of this writing with several publications over a decade old. Airland battle concept broke the battlefield up into close, main, and rear areas and discussed each a separate but related entities.

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<sup>33</sup> Norman, 65.

<sup>34</sup> Dave Wellon (Army artillery officer), interview by author, 4 December 1999, School of Advanced Military Studies, Army Command and General Staff College, Ft. Leavenworth, Kansas.

<sup>35</sup> White.

<sup>36</sup> Norman, 64.

<sup>37</sup> Wellons and Norman 65. Both individuals supported this position.

<sup>38</sup> James R. Brungess, "Setting the Context: Suppression of Enemy Air Defenses and Joint War Fighting in an Uncertain World," (Maxwell AFB, AL: Air University Press, 1994), 94.

<sup>39</sup> Brick Immerman (Navy F-18 pilot), class notes A858 Naval Operational Art, Spring 1999. Army Command and General Staff College, Ft. Leavenworth, Kansas.

<sup>40</sup> Brungess, 94-95.

<sup>41</sup> Ibid, 95-96.

<sup>42</sup> Norman, 66.

<sup>43</sup> Phillip Boggs (Marine Corp artillery officer), interview by author, 4 December 1999, School of Advanced Military Studies, Army Command and General Staff College, Ft. Leavenworth, Kansas.

<sup>44</sup> *Fleet Marine Field Manual 5-45*, "Suppression of Enemy Air Defenses". 1994, 4-3-4-5.

<sup>45</sup> Ibid, 4-1.

<sup>46</sup> John A. Tirpak, "Dealing With Air Defenses." Air Force Magazine, (November 1999), 26.

<sup>47</sup> Norman, 22.

<sup>48</sup> AF magazine, 54-58.

<sup>49</sup> Space Orientation Compact Disk, May 1998 version 1, Army Command and General Staff College, Ft. Leavenworth, Kansas.

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<sup>50</sup> This observation based on the author's operational experience in Air Force combat units from 1990-1998.

<sup>51</sup> Norman, 40.

<sup>52</sup> Air Force Magazine, Nov 1999, 26.

<sup>53</sup> Norman, 40.

<sup>54</sup> Wellons.

<sup>55</sup> Jane's, "Armour and Artillery 1998-99", Alexandria Virginia, 1999, 648-651.

<sup>56</sup> Ibid, 828-833.

<sup>57</sup> Ibid, 832.

<sup>58</sup> John White (Army special forces officer), interview by author, 1 December 1999, School of Advanced Military Studies, Army Command and General Staff College, Ft. Leavenworth, Kansas.

<sup>59</sup> Norman, 64.

<sup>60</sup> Janes, "All the World's Aircraft 1998-99", Alexandria, Virginia, 578-582.

<sup>61</sup> Ibid.

<sup>62</sup> Norman, 64.

<sup>63</sup> Air Force Magazine, Aug 1998, 78.

<sup>64</sup> Norman, 67.

<sup>65</sup> The EA-6B was on the go-no-go lists for Operations Northern and Operation Southern Watch over Iraq and in on most flights over Bosnia and Kosovo during 1997-1998 timeframe. The current status of go-no-go lists are confidential or classified in nature.

<sup>66</sup> Jane's Aircraft, 564-569.

<sup>67</sup> Ibid.

<sup>68</sup> Lt. General Michael Short, Lecture Notes, 6 September 1999, Ft. Leavenworth Kansas. School of Advanced



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Military Studies, Ft. Leavenworth, Kansas. General Short presented three presentations on this date to distinct audiences. The author was fortunate to attend all three presentations included question and answer sessions. The comparison was predominately air-centric versus our coalition partners involved in the operation.

<sup>69</sup> The authors opinion based on experience coordinating the conversion of an F-16 squadron to the SEAD mission.

<sup>70</sup> Norman, 50.

<sup>71</sup> No SEAD courses or electives are taught in the CGSC curriculum. During the graduation exercise, PRAIRIE WARRIOR, J-SEAD coordination efforts are not given credit and are in fact discouraged because the simulators were not programmed to factor in such matters.

<sup>72</sup> Norman, 55.

<sup>73</sup> Ibid, 58. The Army has participates in varying degrees in various flag exercises but in general their participation lags behind the other services.

<sup>74</sup> Air Force Magazine, Aug 1999, 26.

<sup>75</sup> Air Force Times, 7 Nov 1999.

<sup>76</sup> FMFM5-45, 4-1.

<sup>77</sup> Norman, 68.

<sup>78</sup> Besides the exercises that were previously singled out Lt Col Norman's thesis discussed other recurring joint exercises that offer valuable J-SEAD training opportunities. Roving Sands exercises are conducted in exercise activated range space north of Fort Bliss. The Roving Sands exercise range space provides both desert and mountainous training environments. Harpoonex and Giant Warrior Range space is near the island of Guam. These exercises activate over-water training ranges that support HARM live-fire events. Cope North training activates a training range in the vicinity of Misawa, Iwakuni and Okinawa Japan. These ranges provide both over-water and humid-land training environments. Commander seventh fleet (COMSEVENTHFLT) units conduct wars at Sea Exercises (WASEXs) on a regular basis. WASEXs offer J-SEAD training opportunities in an open-ocean environment. Bright Star exercises offer coalition and J-SEAD training opportunities for USAF F-16 SEAD pilots in the

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desert environment of Egypt. Foal Eagle and Ulchi-Focus Lens exercises provide unique J-SEAD training opportunities in Korea.

<sup>79</sup> Norman, 58.

<sup>80</sup> Kristen M. Butler, "ACC Commander Review Events in Gulf Region," Air Force News, 13 February 1998.

<sup>81</sup> Gehler, 35.

<sup>82</sup> Short.

<sup>83</sup> Robert D'Amico. "Joint Fires Coordination: Service Competencies and Boundary Challenges". *Joint Forces Quarterly*. Spring 1999, 71.

<sup>84</sup> Ibid, 73.

<sup>85</sup> Norman, 93.

<sup>86</sup> JP 3-01.4.

<sup>87</sup> Norman, 66.

<sup>88</sup> Brungess, 102.

<sup>89</sup> D'Amico, 73.

<sup>90</sup> Boggs.

<sup>91</sup> "Aircraft Survivability: Manpads, the Real Threat". Edited by Joseph P. Holley, Arlington, Virginia: Joint Technical Coordinating Group on Aircraft Survivability, 1999, 4.

<sup>92</sup> Ibid, 6.

<sup>93</sup> Air Force Magazine, Aug 1999, 24.

<sup>94</sup> Ibid.

<sup>95</sup> Aircraft Vulnerability, 4.

<sup>96</sup> Ibid.

<sup>97</sup> D'Amico, 73.

<sup>98</sup> Gehler, all.

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<sup>99</sup> Ibid, 35.

<sup>100</sup> Air Force Magazine, Aug 98, 26.

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